AMENDMENTS TO THE SPECIFICATION:

Page 1, please add the following new paragraphs before paragraph [0001]:

[0000.2] CROSS-REFERENCE TO RELATED APPLICATIONS

[0000.4] This application is a 35 USC 371 application of PCT/DE 2004/001301 filed on June 22, 2004.

[0000.6] BACKGROUND OF THE INVENTION

Please replace paragraph [0001] with the following amended paragraph:

[0001] ~~Prior Art~~ **Field of the Invention**

Please replace paragraph [0002] with the following amended paragraph:

[0002] The invention relates to an ~~injector according to the preamble to claim 1~~ **improved fuel injector for a direct-injection diesel engine**.

Please add the following new paragraph after paragraph [0002]:

[0002.5] Description of the Prior Art

Please replace paragraph [0003] with the following amended paragraph:

[0003] An injector of ~~this kind~~ **the type with which this invention is concerned** is the subject of ~~the (as yet unpublished) DE … (R.305558)~~ **unpublished application Serial No. 10/559,710**. The advantages of this known injector lie in its comparatively simple design (small number of separate parts) and in the direct control of the nozzle needle by means of the piezoelectric actuator. The speed of the nozzle needle movement can be adjusted by means of the voltage curve of the piezoelectric actuator. The known injector is also distinguished by the fact that it functions properly without a fuel return.

Please replace paragraph [0004] with the following amended paragraph:

[0004] ~~Advantages of the Invention~~

SUMMARY AND ADVANTAGES OF THE INVENTION

Please delete paragraph [0006].

Page 2, please delete paragraph [0007].

Please replace paragraph [0008] with the following amended paragraph:

[0008] **According to the invention, this object is attained in an injector which** ~~The invention~~ advantageously makes it possible to actuate the nozzle outlet progressively by virtue of the fact that the two nozzle needles are triggered sequentially through a corresponding application of voltage to the piezoelectric actuator. The system according to the present invention also has the advantage of functioning properly without a fuel return.

Please replace paragraph [0009] with the following amended paragraph:

[0009] ~~Drawing~~ **BRIEF DESCRIPTION OF THE DRAWINGS**

Please replace paragraph [0010] with the following amended paragraph:

[0010] An exemplary embodiment of the invention is ~~shown in the drawings and will be~~ explained in detail in the subsequent description[[.]] **, taken in conjunction with the drawings, in which:**

Page 3, please replace paragraph [0014] with the following amended paragraph:

[0014] ~~Description of the Exemplary Embodiments~~

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Page 5, please replace paragraph [0023] with the following amended paragraph:

[0023] At the top, the inner chamber 25 of the nozzle body 20 has a stepped diametrical expansion 46 in which the booster piston 33 is guided so that a first control chamber 47 contained in the expanded inner chamber part 46 below the booster piston 33 is hydraulically connected to the annular chamber 17 of the injector body 10 via a leakage gap 48 (see Fig. 2 in particular). A segment 49 of the nozzle body inner chamber 25 with a comparatively small diameter serves to guide the first nozzle needle 21 inside the nozzle body 20. This guiding fit 49 is also designed to have a leakage gap. The first control chamber 47 is thus hydraulically connected via the second leakage gap 49 to the cylindrical chamber 42, which is in turn is exposed to high pressure from the annular chamber 17 of the injector body 10 via the recesses 43 through 45. The inner chamber 32 of the booster piston 33 extending above the nozzle needle 21 is likewise hydraulically connected to the highly pressurized annular chamber 17 of the injector body 10 via a lateral bore 50 in the booster piston 33. The upper (thicker) segment 31 of the first nozzle needle 21 is guided in the booster piston 33 so that an [[(]]additional[[)]] leakage gap 51 is produced (see Fig. 2). This ~~(third)~~ leakage gap 51 consequently hydraulically connects the first control chamber 47 to the highly pressurized annular chamber 17 of the injector body 10.

Page 6, please replace paragraph [0024] with the following amended paragraph:

[0024] Another specific feature is the fact that inside the axial recess 39 – between its shoulder 38 and the shoulder 40 of the second nozzle needle 41 – a [[(]]second[[)]] inner chamber 52 is formed, which is hydraulically connected to the first ~~(outer)~~ control chamber

47. The second ~~(inner)~~ control chamber 52 has a smaller volume than the first ~~(outer)~~ control chamber 47. The two control chambers communicate hydraulically via a bore 53 passing obliquely through the first nozzle needle 21 in the vicinity of its shoulder 38.

Please replace paragraph [0025] with the following amended paragraph:

[0025] As is particularly clear from Fig. 2, moreover, the inner chamber 32 of the booster piston 33 contains a [[(]]second[[)]] helical compression spring 54 that exerts a force on the first nozzle needle 21 in the closing direction (arrow 55). The [[(]]second[[)]] compression spring 54 keeps the first nozzle needle 21 closed during pauses between injections and when the vehicle is not operating. Figs. 1 and 2 show the open position of the two nozzle needles 21 and 41. In this position, an injection is taking place through all of the outlet openings – i.e. in the example shown, the bores 26 through 29. In the process, fuel travels out of the cylindrical pressure chamber 42, through the outlet bores 26 through 29, and into the cylindrical combustion chamber (not shown) of the engine.

Page 7, please replace paragraph [0027] with the following amended paragraph:

[0027] Figs. 1 and 2 (especially Fig. 2) also show that **a** ~~the~~ third spring mechanism 56 contained inside the booster piston 33 acts on the piezoelectric actuator end (upper end) of the second nozzle needle 41 in the direction toward the closed position (arrow 55). The third spring mechanism 56 is a helical compression spring, which is encompassed by and concentric to the second spring mechanism (helical compression spring 54) and which rests against the second nozzle needle 41 at one end and at the other end, rests against the piezoelectric actuator end (upper end) of the inner chamber 32 of the booster piston. To

accomplish this, a shoulder 57 is provided at the piezoelectric actuator end (upper end) of the second nozzle needle 41, adjoined by a smaller-diameter pin piece 58 onto which the helical compression spring 56 is placed.

Page 8, please replace paragraph [0030] with the following amended paragraph:

[0030] The injector described above functions as follows: The piezoelectric actuator 16 is not supplied with current during injection pauses. If the piezoelectric actuator 16 is then electrically triggered, it expands and moves the booster piston 33 downward (in arrow direction 55) counter to the force of the springs 35, 54, and 56. The volume of the control chambers 47 and 52 decreases and the pressure in the control chambers 47, 52 increases. As a result, a force is exerted on both nozzle needles 21 and 41 in the opening direction (arrow 36). As soon as the opening force exceeds the combination of pressure-induced and spring-induced forces, then the nozzle needle that requires the lesser opening force moves in the opening direction (arrow 36). In the exemplary embodiment shown in Figs. 1 and 2, this is the second (inner) [[to]] nozzle needle 41. This is the case because its pressure surface oriented toward the combustion chamber of the engine is smaller than that of the first (outer) nozzle needle 21. As soon as the second (inner) [[and]] nozzle needle 41 opens, the pressure in the control chambers 47, 52 stops ~~decreasing~~ **increasing**. After a short stroke (approx. 0.1 mm, depending on the hydraulic flow) the second nozzle needle 41 strikes its upper stop in which the pin piece 58 comes into contact with the inner (upper) end surface of the booster piston 33. In order now to also move the first (outer) nozzle needle 21 into its open position (Figs. 1 and 2), it is necessary to (further) increase the electrical voltage applied to the

piezoelectric actuator 16. The piezoelectric actuator 16 thus expands again in the axial direction (arrow 55) until the first nozzle needle 21 also moves into the open position (Figs. 1 and 2), thus opening the nozzle outlet openings 28, 29. The distance boosting achieved by the booster piston 33 permits the first nozzle needle 21 to execute a maximum stroke that is significantly greater than the stroke of the piezoelectric actuator 16. (Since the first nozzle needle 21 is supplied with fuel both internally and externally, the stroke can be significantly less than 200 µm.) As soon as the nozzle needles 21, 41 have left the stroke range of seat throttling, they are pressure balanced. At that point, the piezoelectric actuator 16, by means of the booster piston 33, need only keep the pressure in the control chambers 47, 52 far enough above the high pressure (rail pressure) of the fuel supplied at 18 (Fig. 1) to overcome the resistances of the springs 35, 54, and 56. The longest possible triggering duration is determined by the leakage from the control chambers 47, 52. If the pressure in the control chambers 47, 52 falls to the rail pressure, then the nozzle needles 21, 41 close. In order to actively close the nozzle needles 21, 41, it is necessary to reduce the electrical voltage applied to the piezoelectric actuator 16 to zero. As a result, the piezoelectric actuator 16 constricts and the pressure in the control chambers 47, 52 falls below the rail pressure. This exerts closing forces on the nozzle needles 21, 41, which move in the arrow direction 55 and close the nozzle outlet openings 26 through 29. The first (outer) compression spring 35 prevents the piezoelectric actuator 16 from moving away from the booster piston 33.

Page 11, please replace paragraph [0033] with the following amended paragraph:

[0033] [[(]]With an appropriate selection of different stroke boostings for the first and second nozzle needles (21 and 41), it is also possible – if so desired – to open the ~~first~~ **first** (outer) nozzle needle (21) first and only then to open the second (inner) nozzle needle (41).[[)]]

Please replace paragraph [0034] with the following amended paragraph:

[0034] In order to achieve the required first nozzle needle (21) opening stroke of 0.15 mm – more is not necessary since the first nozzle needle (21) is supplied with fuel both internally and externally[[,]] - the piezoelectric actuator (16) must expand lengthwise by 0.05 mm more. In this example, this yields a required total stroke of the piezoelectric actuator (16) of approx. 0.075 millimeters in addition to losses from leakage and compressibility. Assuming that a total of an additional 0.025 mm is required in order to compensate for losses, then it is possible to use a piezoelectric actuator that follows the force/~~path~~ **stroke** curve labeled with reference numeral 64 in Fig. 3.

Page 12, please add the following new paragraph after paragraph [0035]:

[0036] The foregoing relates to a preferred exemplary embodiment of the invention, it being understood that other variants and embodiments thereof are possible within the spirit and scope of the invention, the latter being defined by the appended claims.